Problem/Question/Observation

Does the color of light have an effect on the growth of a bean plant?

Background information: Light is a necessary component to photosynthesis. The process of photosynthesis converts CO2 and H2O into sugars and oxygen with the help of light energy. Light is made up of packages of energy known as photons which can either be reflected or absorbed by a substance. Light though can be different “colors” based upon its wavelength.

Hypotheses:

General: The growth of a plant is affected by the color of light which it is exposed.

Directional: Shining green light onto a plant will make a plant grow taller than shining any other color light onto the plant.

Measureable: Over the course of the experiment, a plant that has been exposed only to green light will grow 3 cm taller than that of a plant that was exposed to any other color light

Materials:

* 10 bean seeds
* Soil
* Water
* 5 plastic containers for planting
* Light sources
* Colored lenses (Green, Red, Yellow, Blue)
* Metric Ruler

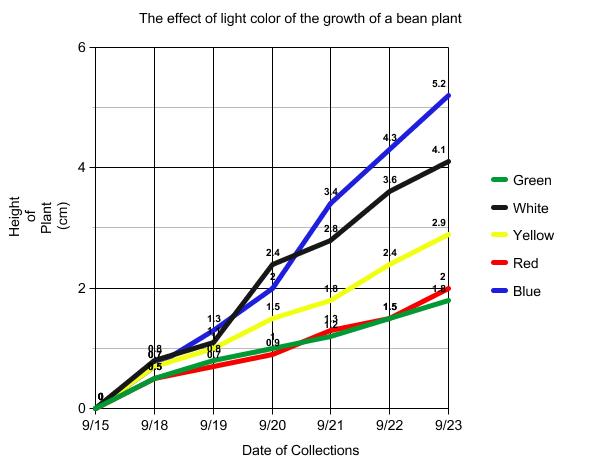
Procedure:

1. Separate the beans into five groups of beans, 2 per group.
2. Label one of the plastic containers “Control” while you label the other plastic containers with the color of light which they will be exposed: Green, Red, Yellow, Blue.
3. Place equal levels of soil into each of the 5 containers, making sure the packing of the soil is approximately the same in each of them. Do not allow the soil to be loose in one container, but tightly packed in another.
4. Measure 3 cm into the soil, and place the bean seeds into the hole. Continue this procedure for each of the other 4 plastic containers.
5. Determine what an appropriate amount of water is to saturate the first plastic container. Do this by measuring a known quantity of water into a beaker. You may transfer the water into a watering can. Water the seed until you have moistened the soil to a point of almost saturation. Pour the remaining water back into the beaker to determine how much water you used on the first bean seed. Use the same amount for each of the four remaining containers.
6. Once all beans have been watered, place the containers under the appropriate light. Be sure to place your name somewhere on the plastic container so you will be able to distinguish yours from the other groups conducting the laboratory.
7. At the beginning of each day, measure the height that the bean seed has reached. Be sure to stretch out the stem while you are doing this to avoid inconsistency with measuring.
8. Record the daily height onto a data chart.
9. After a sufficient amount of time has passed and enough data has been collected to draw a definite conclusion, throw the contents of the plastic container away and clean all supplies.

Data/Results

The effect of light color on the growth rate of a bean plant

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Color of Light | Height of plant in centimeters above the surface of the soil across the collection period. | | | | | | |
|  | 9/15 (initial day of planting) | 9/18 | 9/19 | 9/20 | 9/21 | 9/22 | 9/23 |
| White | 0 | .8 | 1.1 | 2.4 | 2.8 | 3.6 | 4.1 |
| Green | 0 | .5 | .8 | 1.0 | 1.2 | 1.5 | 1.8 |
| Red | 0 | .5 | .7 | .9 | 1.3 | 1.5 | 2.0 |
| Yellow | 0 | .7 | 1.0 | 1.5 | 1.8 | 2.4 | 2.9 |
| Blue | 0 | .7 | 1.3 | 2.0 | 3.4 | 4.3 | 5.2 |



Data Analysis/Conclusions

Of the three hypotheses stated, only one can be accepted. The general hypothesis which stated, “The growth of a plant is affected by the color of light which it is exposed” proved to an accurate statement. According to the data collected across a one week time period, the color of the light did have an effect on the growth pattern. No two light colors caused the bean to grow at exactly the same rate nor the same height. The blue light proved to be the light that caused the most growth over the one week time with a height reaching 5.2 cm, even though initially it grew only .7 cm after the first weekend. White light also seems to be beneficial to the growth of a plant, since it came in with the second greatest height of 4.1 cm. Others that followed were yellow- 2.9 cm, red with 2.0 cm, and coming in with the shortest plant after one week was the green light which only reached 1.8 cm. Even though the data shows green had a very similar growth pattern as red, it did not surpass the red group at the conclusion of the data collection period. The other two hypotheses stated that green would have caused the most growth. According to the numbers presented, this was not the case. The measureable hypothesis was rejected without hesitation since it predicted that green would be at least 3 cm taller than any other plant growing in the experiment.

According to this data, light must have an effect on the rate at which photosynthesis occurs in a bean plant. Green light must cause photosynthesis to work at a much slower rate because the growth of a plant is directly related to how quickly the light energy can convert the water and carbon dioxide into a more useable form of energy. Since light can either be reflected or absorbed, the green light must not be absorbed as quickly as blue light is absorbed into a plant.

Within the week long collection of data, some variables could not be controlled, therefore could have affected the outcome of the results. Even though the amount of water poured onto the plant was controlled, the amount of water that the seed absorbed could not be controlled. If a seed is going to take in more water than in another container that will aid in a quicker rate of photosynthesis, therefore causing the growth or the lack of growth to be cause not by the light but rather by the water. The reason for placing two seeds into the plastic container was to increase the chances that at least one seed would sprout. It should be noted that only one seed sprouted in the yellow bean container, whereas two sprouted in the green container. This increased competition in the green light container, so this could have potentially caused a slower growth in the green plastic container because two bean seeds would need the resources that were present. The yellow light container only needed to provide resources for one seed, therefore eliminating the competition.

In the end, the errors may have contributed to a slight deviation in the results, but to the extent that the results would have changed enough to overturn our hypotheses is not likely.